IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)
Title	**IEEE 802.15.2 Clause 14.1 - Collaborative Coexistence Mechanism**
Date Submitted	[July 9, 2001]
Source	[Steve Shellhammer] [Symbol Technologies] [One Symbol Plaza, MS B-2] [Holtsville, NY 11742] Voice: [(631) 738-4302] Fax: [(631) 738-4618] E-mail: [shell@symbol.com]
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Purpose	[Initial Text Submission]
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14.1.1 Collaborative Coexistence Mechanism

The WLAN/WPAN collaborative coexistence mechanism requires a communication link between the WLAN and WPAN networks. This communication link can be a wired connection between a WLAN radio and a WPAN radio, if they are both embedded in the same host unit. This collaborative mechanism is used to coordinate access to the wireless medium, between the WLAN and WPAN. There are two types of collaborative mechanisms. The first approach alternately schedules wireless medium access between the WLAN traffic and the WPAN traffic. The second approach schedules WLAN/WPAN packet transmissions on a packet-by-packet basis. Both mechanisms are described in this clause.

14.1.2 Alternating Wireless Medium Access (AWMA)

The IEEE 802.11 WLAN Access Point sends out a beacon at a periodic interval. The beacon period is T_B. AWMA subdivides this interval into two subintervals: one for WLAN traffic and one for WPAN traffic. Figure 14.1.x illustrates the separation of the WLAN beacon interval into two subintervals. The WLAN interval begins just prior to the WLAN *target beacon transmit time* (TBTT). The time from the beginning of the WLAN interval to the TBTT is specified as T_1. The duration of WLAN subinterval is T_{WLAN}. The duration of the WPAN subinterval is T_{WPAN}. The combined duration of these two subintervals must equal the WLAN beacon period. So $T_{WLAN} + T_{WPAN} = T_B$. Table 14.1.x specifies the allowed range of values for T_1.

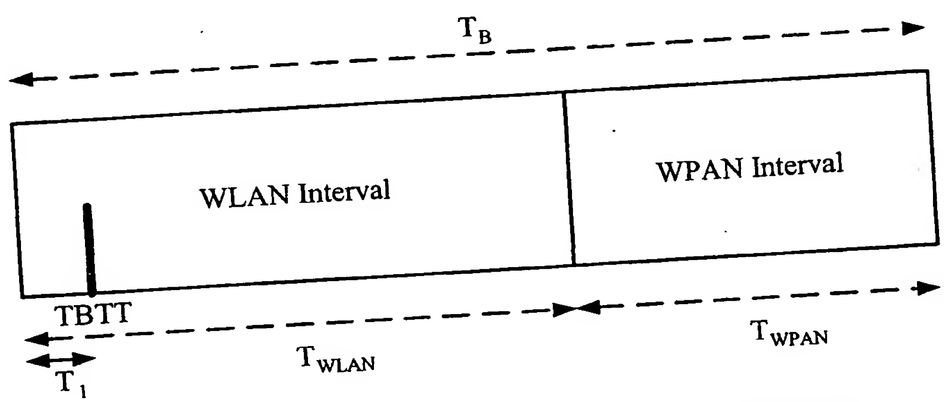

Figure 14.1.x: Timing of the WLAN and WPAN subintervals

Minimum value of T_1	Maximum value of T_1
TBD	TBD

Table 14.1.x: Allowed range of values for T_1

14.1.3 WLAN/WPAN Synchronization

AWMA requires that a WLAN node and the WPAN master are collocated in the same physical unit (e.g. both within a single laptop computer). AWMA requires the WLAN node to control the timing of the WLAN and WPAN subintervals. All WLAN nodes connected to the same Access Point are synchronized, and hence have the same TBTT time. As a result all units with implementing AWMA have synchronized WLAN and WPAN subintervals. The WLAN node is required to send a physical synchronization signal to the WPAN master, which is in the same physical unit as the WLAN node. That synchronization signal specifies the WLAN interval as well as the beginning of the WPAN interval. This synchronization signal is called the *Medium Free* signal. When the Medium Free signal is True that signals that the Medium is free of WLAN traffic. Figure 14.1.x illustrates the Medium Free signal.

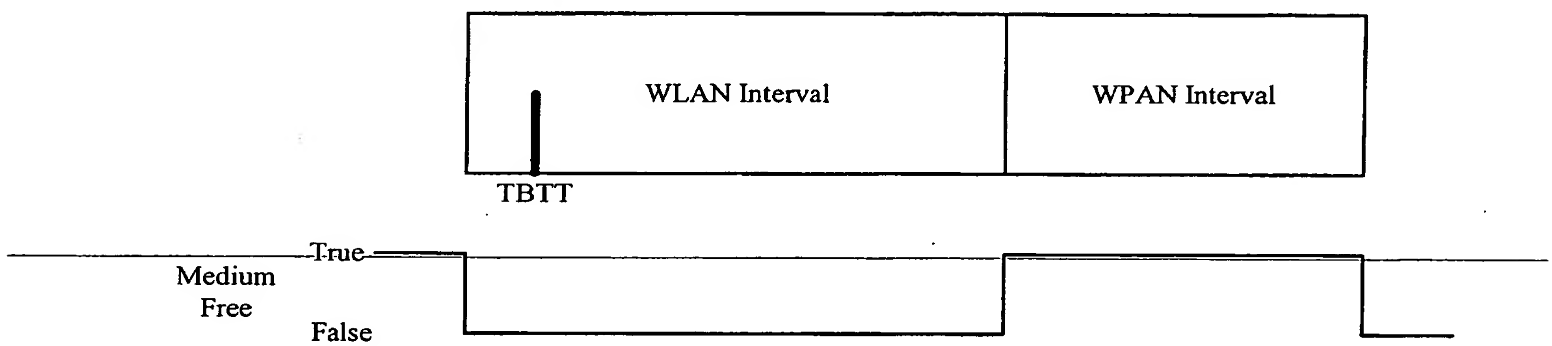

Figure 14.1.x: Medium Free Signal

14.1.4 Restriction on WLAN and WPAN Transmissions

AWMA requires that all WLAN transmissions are restricted to occur during the WLAN subinterval. Similarly, all WPAN transmissions are restricted to the WPAN subinterval. The WLAN mobile units and the WLAN Access Points all share a common TBTT, so along with shared knowledge of the value of T_I, all WLAN devices must restrict their transmissions to be within the common WLAN subinterval.

The WPAN devices collocated with the WLAN nodes must be the WPAN master device. In particular, if the WPAN device conforms to IEEE 802.15.1 all Asynchronous Connectionless (ACL) data transmissions are controlled by the WPAN master. In particular, WPAN slaves can only transmit ACL packets if in the previous time slot the WPAN slave received an ACL packet. Therefore, the WPAN master must end transmission long enough before the end of the WPAN interval so that the longest slave packet (e.g. a five-slot 802.15.1 packet) will complete its transmission prior to the end of the WPAN interval. Figure 14.1.x illustrates the timing requirement. The value of T_M must be large enough so as to ensure that the value of T_S is greater

than zero.

IEEE 802.15.1 WPAN devices also support Synchronous Connection-oriented packets, for voice traffic. These packets occur on a regular basis with a fixed period. There are several SCO types, depending on the level of forward error correction. For example, an HV3 link repeats every 6 slots. The first two slots are used for SCO packets and the last four packets can either be used for ACL packet or remain unused time slots. In IEEE 802.15.1 a time slot is 0.625 ms. So the SCO HV3 period is 3.75 ms. This is a small fraction of the typical WLAN beacon period. As a result if the WLAN beacon period is subdivided into two subintervals, the WPAN SCO packets could not be restricted to the WPAN interval. As a result this coexistence mechanism does not support IEEE 802.15.1 WPAN SCO links.

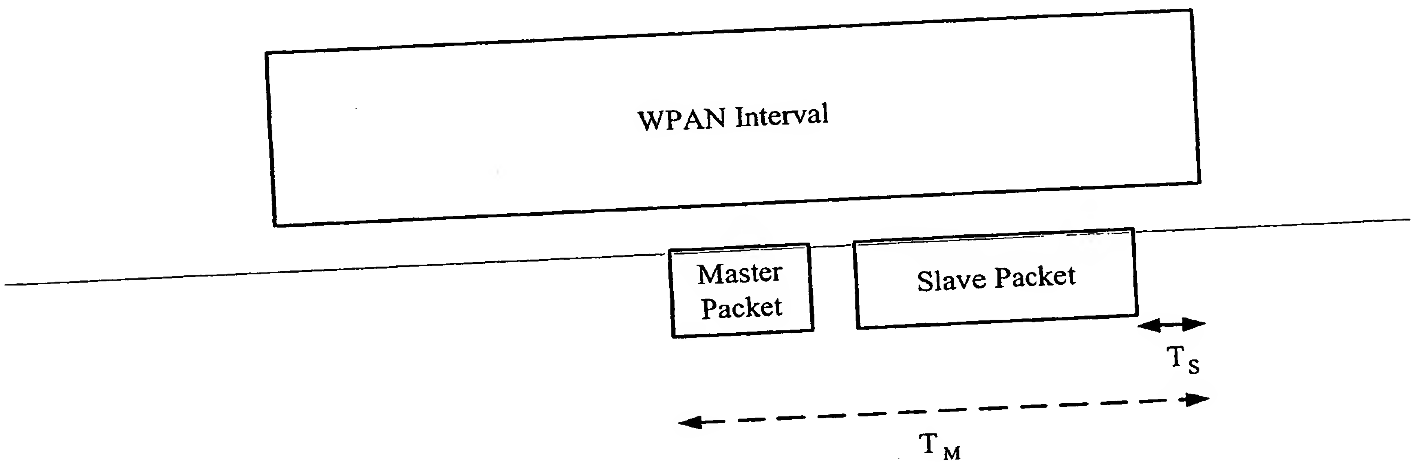

Figure 14.x: Timing of WPAN packets

14.1.5 Controlling Transmission of Legacy 802.11 Nodes

An optional feature in AWMA is for the Access Point to send out a Clear to Send (CTS) packet addressed to an address of a WLAN node not attached to the AP. The duration field in the CTS packet should be sufficiently long to ensure that the legacy 802.11 nodes will not transmit until the next WLAN interval. This technique causes the legacy 802.11 nodes to conform to the AWMA policy of now WLAN wireless traffic during the WPAN subinterval.